

# Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/SE05/000007

International filing date: 07 January 2005 (07.01.2005)

Document type: Certified copy of priority document

Document details: Country/Office: GB  
Number: 0402898.1  
Filing date: 10 February 2004 (10.02.2004)

Date of receipt at the International Bureau: 03 March 2005 (03.03.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland  
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse



PCT / SE 2005 / 000007

22-02-2005



INVESTOR IN PEOPLE

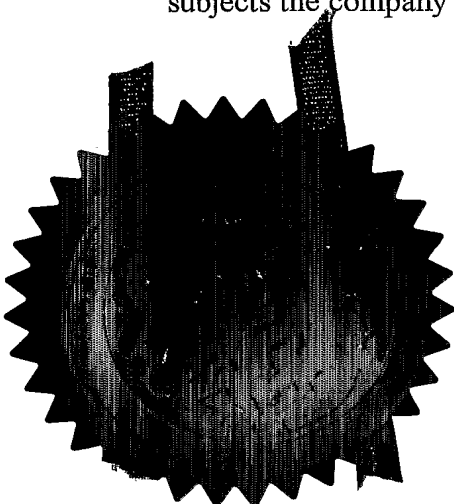
The Patent Office  
Concept House  
Cardiff Road  
Newport  
South Wales  
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

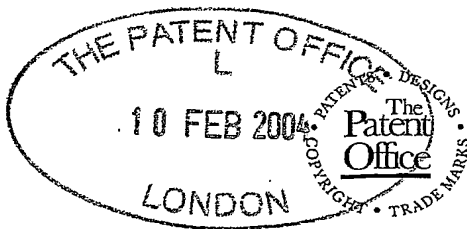
Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.



Signed *William Morell*

Dated 11 February 2005





15

11FEB04 0972188-3 000389  
P01/7700 0.00-0402898.1 CHEQUE

## Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

10 FEB 2004

The Patent Office

Cardiff Road  
Newport  
South Wales  
NP10 8QQ

1. Your reference

P18432GB-NF/jsd

2. Patent application number

(The Patent Office will fill this part in)

0402898.1

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Autoliv Development AB  
Patent Department  
S-447 83 VARGARDA  
Sweden

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

SWEDEN

0321018006

4. Title of the invention

"Improvements in or Relating to an Air-Bag"

5. Name of your agent (if you have one)

Forrester Ketley & Co.

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Forrester House  
52 Bounds Green Road  
London  
N11 2EY

Patents ADP number (if you know it)

133001

6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months.

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note f)

Number of earlier UK application

Date of filing  
(day / month / year)

8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

Answer YES if:

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

Yes

Otherwise answer NO (See note d)

## Patents Form 1/77

Accompanying documents: A patent application must include a description of the invention. Not counting duplicates, please enter the number of pages of each item accompanying this form:

Continuation sheets of this form

Description	8
Claim(s)	2 <i>DL</i>
Abstract	1
Drawing(s)	3 + 3

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77) 5 ✓

Request for a preliminary examination and search (Patents Form 9/77) 1 ✓

Request for a substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. ☒ We request the grant of a patent on the basis of this application.

Signature(s)

*Forrester Kelley & Co*  
Forrester Kelley & Co.

Date 10 February, 2004

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

FRANKLAND, Nigel H.  
(020) 8889 6622

fk london@forresters.co.uk

### Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

### Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.
- Write your answers in capital letters using black ink or you may type them.
- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered YES in part 8, a Patents Form 7/77 will need to be filed.
- Once you have filled in the form you must remember to sign and date it.
- Part 7 should only be completed when a divisional application is being made under section 15(4), or when an application is being made under section 8(3), 12(6) or 37(4) following an entitlement dispute. By completing part 7 you are requesting that this application takes the same filing date as an earlier UK application. If you want the new application to have the same priority date(s) as the earlier UK application, you should also complete part 6 with the priority details.

PATENTS ACT 1977

P18432GB-NF/jsd

5

# DESCRIPTION OF INVENTION

## **"IMPROVEMENTS IN OR RELATING TO AN AIR-BAG"**

10

**THE PRESENT INVENTION** relates to an air-bag, and more particularly relates to an air-bag intended for use in a motor vehicle to provide protection for an occupant of the motor vehicle.

15

It has been proposed previously to fabricate air-bags from a number of different materials. Many air-bags are fabricated using a fabric material, which is woven from appropriate threads. Such an air-bag is typically folded and stored within an appropriate housing. On deployment of the air-bag the air-bag emerges from the housing and unfolds. Air-bags of this type may be of particular use as steering wheel air-bags or air-bags mounted in the front dashboard, since the air-bag, on deployment, moves into a free space in which it can unfold.

25

Other air-bags are provided which are located at other positions within the motor vehicle. For example, an air-bag may be mounted in the squab of the seat of a vehicle, at a point just in front of the hips of the seat occupant. The air-bag may be inflated during an accident situation to provide a ridge extending across the front part of the seat to minimise the risk of the seat

occupant "submarining". Alternatively an air-bag may be mounted on the floor of the motor vehicle in the region of the feet of a seat occupant. Such an air-bag may be inflated during an accident situation in order to lift the feet of the seat occupant above the floor pan of the vehicle. This may minimise the risk of injury being imparted to the feet, ankles and legs of the seat occupant by the deformation of the floor pan that occurs during an accident.

It has also been proposed to provide a knee air-bag, in the form of an air-bag mounted on the underside of the dashboard of the motor vehicle, the air-bag being intended to inflate into the space between the dashboard of the motor vehicle and the knees of an occupant of the vehicle in order to prevent the knees of the occupant moving forwardly and impacting with the dashboard in such a way that knee injury is caused.

Many of these air-bags have to be made of a material that does not unfold on inflation, since the air-bag is located in such a position that there is no free space available for the air-bag to unfold.

Such air-bags often have to survive hostile conditions, especially a floor-mounted air-bag, which may be subjected to scuffing and also to a rather damp environment.

It has been proposed to fabricate bags of the type generally discussed above from various materials including metal and polymer materials.

The present invention seeks to provide an improved method of fabricating an air-bag, and an improved air-bag.

According to this invention there is provided a method of making an air-bag, the method comprising the steps of blow moulding a selected plastics material to form the air-bag utilising a mould corresponding to the final uninflated state of the air-bag, the mould being such that the moulded air-bag  
5 has at least one indented region which, on inflation of the air-bag, becomes outwardly extending.

Preferably the method comprises the additional step of providing a gas generator for the air-bag.  
10

Advantageously the indented region comprises an indented groove.

Conveniently the groove is annular.

Advantageously the indentation comprises a central indented area.  
15

Preferably the plastic comprises at least 40% ABS and/or PC.

Conveniently the plastic comprises at least 80% ABS and/or PC.  
20

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:  
25

FIGURE 1 is a part section, part phantom view of an air-bag in accordance with the invention prior to inflation,



FIGURE 2 is a view of the air-bag of Figure 1 following inflation,

FIGURE 3 is a view corresponding to Figure 1 showing an alternate air-bag in accordance with the invention prior to inflation,

5

FIGURE 4 is a view showing the air-bag of Figure 3 after inflation,

FIGURE 5 is a view corresponding to Figure 1 showing a further embodiment of an air-bag prior to inflation, and

10

FIGURE 6 is a view of the air-bag following inflation.

Referring initially to Figure 1, an air-bag 1 is shown. The air-bag 1 comprises a unitary body which is extruded and then blow moulded from an appropriate plastics material. Thus a parison is prepared by extrusion, the parison subsequently being blow moulded.

15

The preferred plastics material incorporate, at least as a substantial component, acrylonitrile-butadiene-styrene (ABS) or polycarbonate (PC). It has been satisfactory to use a material that is solely ABS and also a material that is solely polycarbonate. It has also been satisfactory to use a resin which is a mixture of PC and ABS. It is also believed that a mixture of polycarbonate and polyethylene terephthalate may prove to be satisfactory, consequently the preferred material incorporates at least 40% of polycarbonate and/or acrylonitrile-butadiene-styrene. Preferably the material incorporates at least 80% of polycarbonate and/or acrylonitrile-butadiene-styrene.

20

25

The selected plastics material is extruded, in a molten form to create a parison, which is inserted into an appropriately shaped mould. The plastics

material of the parison is then blow moulded in the mould. The mould is shaped so as to produce directly an air-bag, such as the air-bag 1 shown in Figure 1, without the need for any subsequent processing of the air-bag, or with a need for minimal further processing, such as the simple cutting of a hole from the gas generator or for a vent.

As can be seen from Figure 1 the air-bag comprises an inflatable region 2 of generally oval form, and, connected to one side of the inflatable region 2, an integral chamber 3 to receive a gas generator. The gas generator to be received within the housing 3 may be of generally cylindrical form. The housing 3 is provided with a an access aperture 4 provided at one end thereof through which the gas generator may be mounted in position. The gas generator itself may seal the aperture 4, or the aperture 4 may be sealed in some other way.

The oval inflatable region 2 is, in the uninflated state, of an overall generally flat configuration. The part of the moulding 5 which defines the lower surface of the inflatable region 2, in the orientation illustrated, is generally flat, but is provided with an oval inwardly directed groove which is located at a position spaced slightly inwardly from the outer periphery of the oval inflatable region 2.

The part of the moulding defining the upper layer 7 of the inflatable region is provided with an inwardly directly indented oval channel 8 located adjacent the periphery of the inflatable region 2, which is separated by an upstanding or outwardly directed ridge 9, from a further oval inwardly indented region 10. The ridge 9 is co-aligned with the groove 6.

The air-bag of Figure 1 may be located in position with the lower-most part 5 of the inflatable region 2 positioned against some sort of support so that, on deployment of the air-bag, it is only the upper part 7 of the inflatable region 2 which moves.

5

It is to be understood that when gas from the gas generator is injected into the interior of the air-bag, the inwardly indented regions forming the inwardly indented groove 8 and the inwardly indented central oval region 8 will be deformed so as to be outwardly directed. The air-bag will thus inflate to  
10 have the form shown in Figure 2.

It will be appreciated, therefore, that the air-bag 1 is blow moulded from a selected plastics material and is blow moulded to have a form with at least one inwardly indented region. When gas is directed to the interior of the air-  
15 bag, the inwardly indented region becomes deformed, enabling the air-bag to become inflated.

The air-bag of Figures 1 and 2 is designed to be used as a side air-bag, in which case it would be mounted on an appropriate part of a vehicle body, or a  
20 knee bag, in which case the air-bag will be mounted on the under-surface of a vehicle dashboard.

Figures 3 and 4 illustrate an alternative form of air-bag 20. The air-bag 20 has an inflatable region 21 of generally oval form. The under-surface of  
25 the inflatable region is provided with an inwardly directed channel 22 adjacent the periphery of the oval region, and a centrally located protruding chamber 23 which can accommodate a gas generator.

The upper part 24 is provided with an inwardly indented peripheral overall groove 25 which surrounds a substantially planar central oval region 26.

As can be seen from Figure 4, on inflation of the air-bag, the indented  
5 annular groove 25 becomes outwardly extended, and the planar region 24 also bows outwardly, to provide a fully inflated air-bag.

Again this air-bag may be used as a side air-bag or as a knee air-bag.

10 Figure 5 and 6 illustrate yet a further embodiment of an air-bag 30, which is again formed as a blow moulding of a selected plastics material. The air-bag 30 is intended for use as an anti-submarining air-bag in a vehicle seat.

The air-bag is provided with a generally rectangular overall form. The  
15 under-surface 31 of the air-bag is provided, at a forward edge of the air-bag, with an indentation 32 positioned to accommodate a front transverse beam of a vehicle seat. A further rearward indentation 33 is provided to accommodate a further transverse beam, and the intervening part 34 of the under-region 31 of the air-bag defines a chamber.

20

The upper surface 36 of the air-bag is provided with a generally planar peripheral region 37. An oval inwardly directed indentation 38 is provided which surrounds a central outwardly protruding formation 39.

25 On inflation of the air-bag the indented channel 38 becomes outwardly extending, permitting full inflation of the air-bag.

The use of the selected plastics material enables the air-bag to be manufactured cheaply and quickly, whilst providing an air-bag that can withstand hostile conditions.

5           When used in this Specification and Claims, the terms "comprises" and "comprising" and variations thereof mean that the specified features, steps or integers are included. The terms are not to be interpreted to exclude the presence of other features, steps or components.

10           The features disclosed in the foregoing description, or the following Claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse  
15   forms thereof.

## CLAIMS:

- 5 1. A method of making an air-bag, the method comprising the steps of blow moulding a selected plastics material to form the air-bag utilising a mould corresponding to the final uninflated state of the air-bag, the mould being such that the moulded air-bag has at least one indented region which, on inflation of the air-bag, becomes outwardly extending.
- 10 2. A method according to Claim 1 comprising the additional step of providing a gas generator for the air-bag.
3. A method according to Claim 1 or 2 wherein the indented region  
15 comprises an indented groove.
4. A method according to Claim 3 wherein the groove is annular.
5. A method according to any one of Claim 3 or 4 wherein the indentation  
20 comprises a central indented area.
6. A method according to any one of the preceding Claims wherein the plastic comprises at least 40% ABS and/or PC.
- 25 7. A method according to Claim 6 wherein the plastic comprises at least 80% ABS and/or PC.
8. A method according to any one of the preceding Claims wherein the plastic comprises ABS and/or PC.

9. An air-bag made by a method according to any one of the preceding Claims.

5 10. An air-bag substantially as herein described with reference to and as shown in Figures 1 and 2 of the accompanying drawings.

11. An air-bag substantially as herein described with reference to and as shown in Figures 3 and 4 of the accompanying drawings.

10

12. An air-bag substantially as herein described with reference to and as shown in Figures 5 and 6 of the accompanying drawings.

13. Any novel feature or combination of features disclosed herein.

## ABSTRACT

5 **IMPROVEMENTS IN OR RELATING TO AN AIR-BAG**

A method of making an air-bag is disclosed in which a selected plastics material is blow moulded within an appropriate mould to form a blow moulded  
10 air-bag. The mould is such that the blow moulded air-bag (1) has at least one indented region, such as a central oval region (10) of the upper part (7) of the air-bag, which, on inflation of the air-bag, becomes outwardly extending.





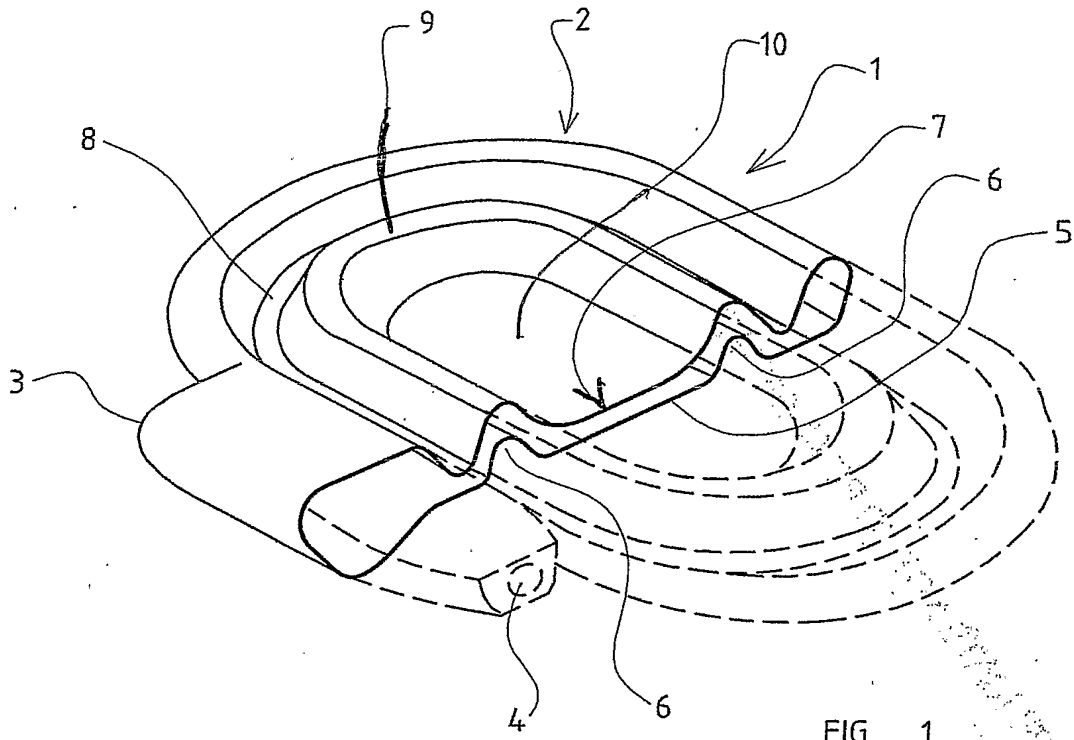


FIG 1

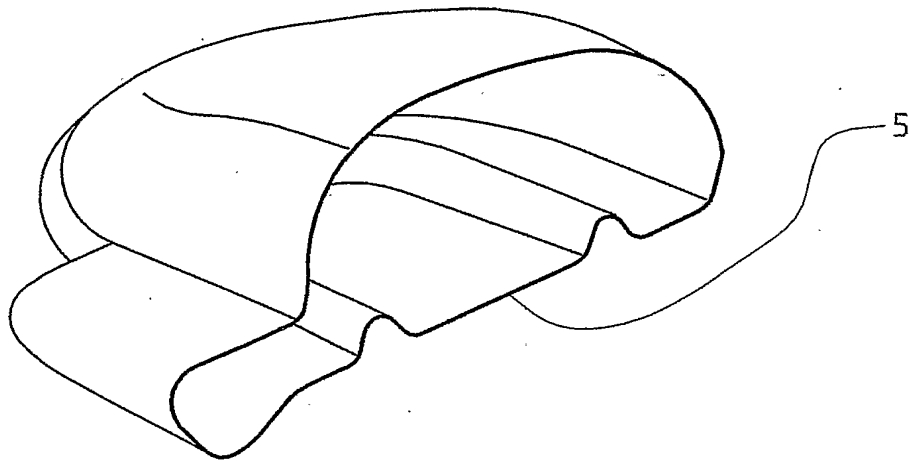


FIG 2



2 / 3

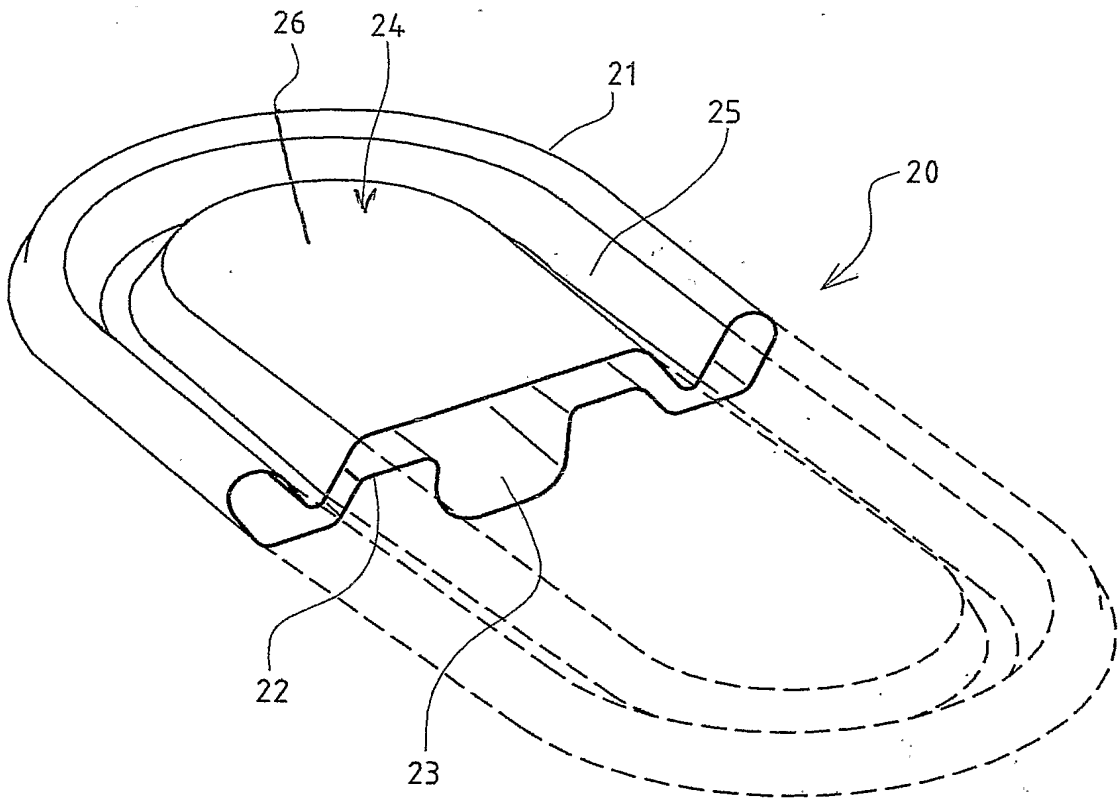


FIG 3

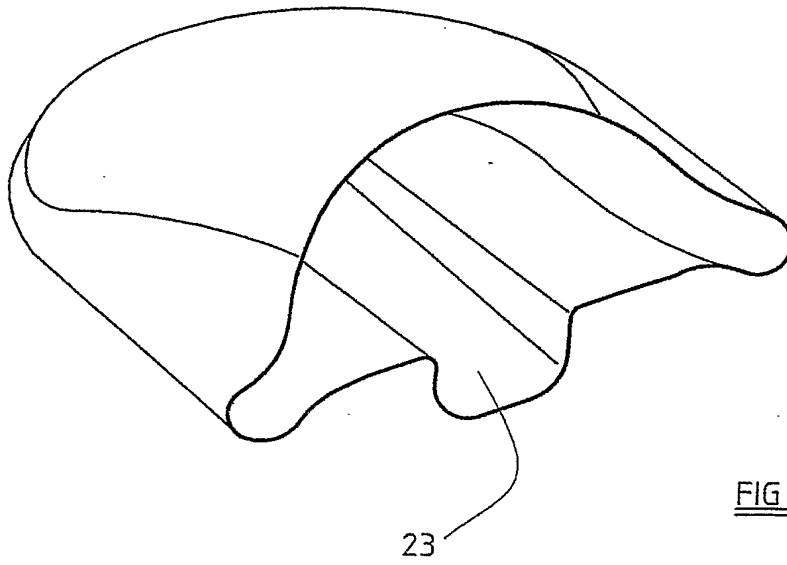


FIG 4



3 / 3

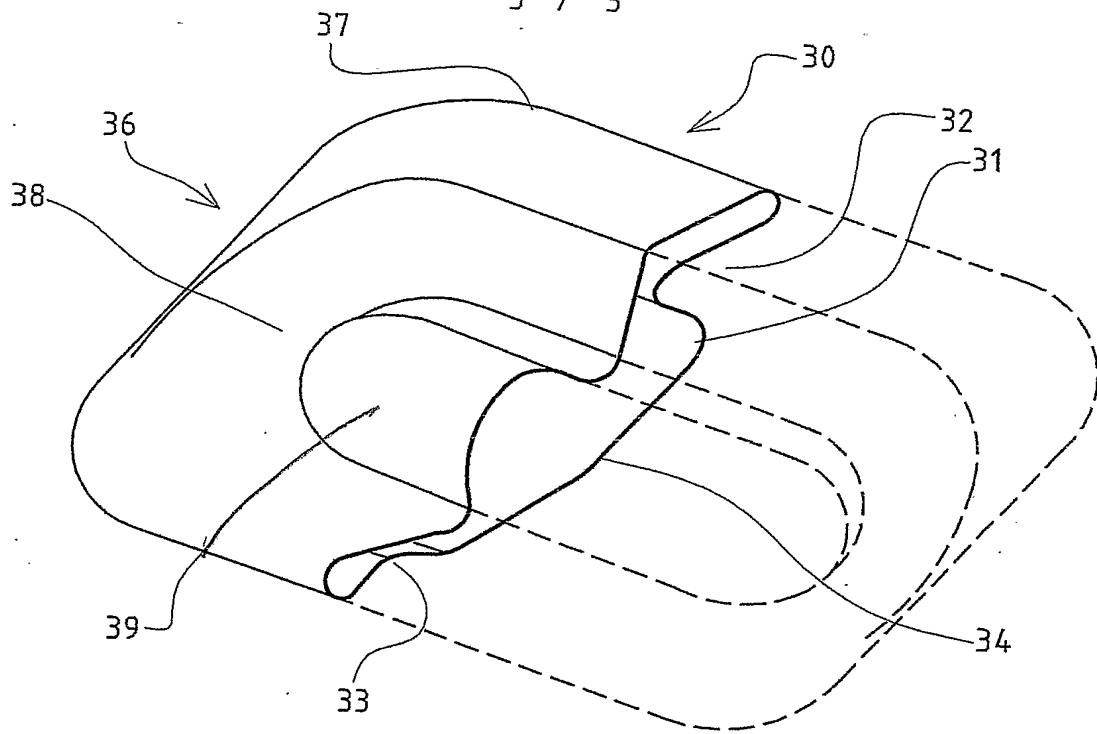


FIG 5

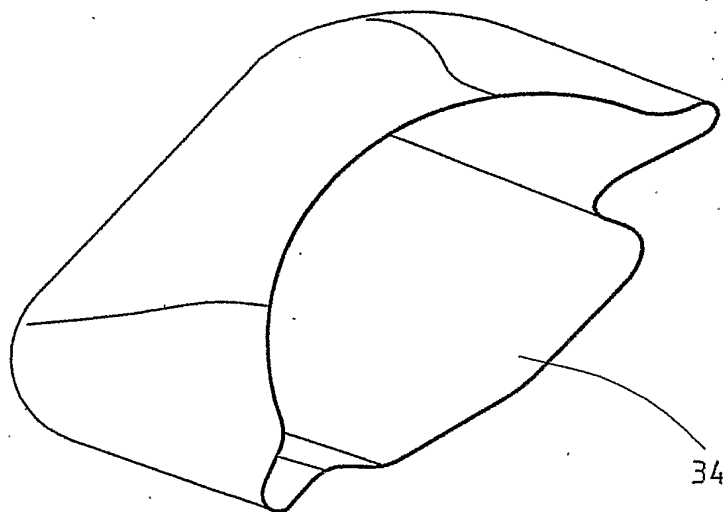


FIG 6

